Earth's Atmosphere and Weather

6-4 The student will demonstrate an understanding of the relationship between Earth's atmospheric properties and processes and its weather and climate. (Earth Science)

6-4.1 Compare the composition and structure of Earth's atmospheric layers (including the gases and differences in temperature and pressure within the layers).
Taxonomy level: 2.6-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have not been introduced to the concepts of Earth's atmosphere and its layers in previous grades. Air pressure is also a new concept. In 2nd grade (2-3.1), students explained the effects of moving air as it interacts with objects. In 3rd grade (3-4.1), students classified different forms of matter (including gases). In 4th grade (4-4.3), students compared daily and seasonal changes (including wind speed). These previous experiences can aide the study of the atmosphere here.

It is essential for students to know that Earth's *atmosphere* is the layer of gases that surrounds the planet and makes conditions on Earth suitable for living things.

Atmospheric Layers	Earth's atmosphere is divided into several different *atmospheric layers* extending from Earth's surface outward	• the *troposphere*, where all weather occurs • the *stratosphere*, where the ozone layer is contained • the *mesosphere* • the *thermosphere* • the *exosphere*	Earth's Surface ↓ Space
Atmospheric Gases	Nitrogen and Oxygen Ozone Water vapor and Carbon dioxide Trace gases, for example argon	• the two most common gases; found throughout all the layers • a form of oxygen found in the stratosphere • important gases for weather conditions; found in the troposphere • play an insignificant role	
Atmospheric Temperatures	Differences in temperature separate the layers	• As altitude increases, temperature decreases in the *troposphere* • The *stratosphere* is cold except in its upper region where ozone is located • The *mesosphere* is the coldest layer • Even though the air is thin in the *thermo- sphere*, it is very hot • The cold regions of outer space	

		extend from the *exosphere*	
Atmospheric Pressure	The *air pressure*, the force exerted by the gases pushing on an object, is greatest near the surface of Earth, in the *troposphere*.	• Air pressure decreases through the layers farther out from the surface as Earth's pull of gravity decreases.	Troposphere pressure decreases ↓ Exosphere

It is not essential for students to know the exact distance between each layer or the temperatures of the layers. The chemistry of the different gas particles (such as H_2 is an element, and CO_2 is a compound) is not expected at this grade level. They do not need to compare the properties of pure air with air containing particulate matter and unnatural gases, polluted air.

Assessment Guidelines:
The objective of this indicator is to *compare* the composition and structure of Earth's atmospheric layers; therefore, the primary focus of assessment should be to detect similarities and differences between the layers (including the gases and differences in temperatures and pressure within the layers). However, appropriate assessments should also require students to *identify* common gases or the layer where weather occurs; *recall* where the ozone layer is located; or *classify* by sequencing the layers.